Appendix B

Emissions Accounting Issues

Appendix B

Emissions Accounting Issues

Introduction

The Department of Energy's guidelines for the Voluntary Reporting Program took the view that reporters should themselves define the emissions and reductions for which they felt themselves responsible. The Energy Information Administration (EIA) attempted to develop a reporting system in which diverse definitions could be made clear to data users. In attempting to achieve this objective, the EIA has identified several emissions accounting issues that presented significant problems in understanding and interpreting the data.

These accounting issues are common to the design of many programs to limit the emissions of environmental residuals and, consequently, may be of interest beyond the Voluntary Reporting Program. The sulfur trading program under the Clean Air Act Amendments, Climate Change Action Plan voluntary programs, Joint Implementation, and the "Clean Development Mechanism" proposed under the Kyoto Protocol all must confront similar challenges, which can be summed up by four questions:

- Who participates?
- What is a reportable action?
- Who owns the emission or reduction?
- What is a reduction?

In addition to these central questions, the Department of Energy and EIA also confronted the following, more technical reporting issues:

- Fuel cycle costs
- Confidentiality of reporting
- Domestic vs. foreign reporting
- Mergers and acquisitions
- Emissions trading
- Data validation and accuracy.

This appendix describes the nature of the issues and the approaches adopted by the Department of Energy's Guidelines and the EIA.

Who Participates: The Nature of the Entity

As noted in Chapter 7 of this report, there are different views about the nature of the entity, and reporters have adopted various conventions. In general, the most common definition of the entity is a corporation; however, reporters have made a number of modifications to this concept. For example, General Motors excluded its overseas operations from its definition of its corporate entity. Most electric utilities defined their entities as their regulated utility activities, excluding unrelated activities owned by their holding companies. Houston Light & Power excluded the activities of its parent company, Houston Industries, which include a cable TV operation.

Not all entities are corporations. Several reporters are facilities, notably, Alcan's Sebree Aluminum Plant, which reduced emissions of perfluorocarbons. Similarly, AES Corporation's subsidiaries, AES Hawaii and AES Shady Point, reported on forest preservation projects in the South American countries of Paraguay and Bolivia, respectively. AES Thames, another subsidiary of the AES Corporation, reported on its CARE Agroforestry project in Guatemala, which was designed to plant trees, to prevent or reduce the future loss of forest, and to control soil erosion through reforestation activities and soil conservation measures.

In addition, there were a number of instances of one organization reporting on behalf of another organization. A trade association, the Integrated Waste Services Association, reported on the aggregated emissions and reductions of its members. Several firms and non-governmental organizations reported on projects, such as landfill methane recovery or forest planting or preservation, which they undertook on behalf of another organization. In these cases, the legal owner of the project, the emission, or the emission reduction was not necessarily the reporter.

Reportable Actions: Types of Reports

The language of the statute calls for reporting of "annual reductions of greenhouse gas emissions . . . achieved through any measures . . ." (1605(b)(1)(B)), and separately calls for "an aggregate calculation of greenhouse gas emissions by each reporting entity." As interpreted in the guidelines and in the forms, it establishes two categories for the reporting of emission reductions:

- An "entity-wide" report, where the emissions reported are the emissions of the entire entity (for example, the total emissions of a particular electric utility). The emissions of the entity can rise or fall. Some firms (6) did not report emission reductions for 1997 but simply reported emissions.
- A "project report," where the reporter indicates the results of certain specified actions taken (called "projects") that resulted in a reduction of emissions of greenhouse gases (or increased sequestration). Most firms that filed entity-wide reports also filed one or more reports on projects.

These two approaches to reporting encompass alternative approaches to accounting for emission reductions activities. An entity report reflects the view that the relevant unit for analysis is an institution, defined as a legal person or a facility. A project report, on the other hand, reflects the view that the relevant unit of analysis is the emission reduction action taken by the reporter.

Ownership of Emissions and Reductions

An issue that emerged in the process of developing the guidelines was the question of defining exactly who is responsible for or "owns" particular emissions and reductions. The most intuitive definition is that ownership of the emission comes with ownership of the source of the emission: the smoke stack or the fuel. Emissions accounting based on source ownership is relatively easy to understand and measure and can in principle be objectively audited. Source ownership (usually based on facilities) has been adopted for most U.S. environmental regulation of point-source emissions.

The source ownership approach works best when all relevant sources participate. In a closed system, the emission reductions of one participant may be offset by the emissions growth of another participant, but both participants' emissions are reported. In an open system, where some emitters participate and others do not, any individual company can reduce its emissions by "outsourcing" (buying rather than making an emissions-intensive product, such as electricity), while companies with growing emissions may elect not to participate.

An alternative approach is to define responsibility on the basis of causation: an emission or reduction is the responsibility of the person whose action caused the emission or reduction to occur. A causation-based approach is, in principle, more comprehensive than a source ownership-based approach, permits the recognition of an enormous range of emissions-reducing actions, and accommodates fuel cycle costs. On the other hand, actions may have multiple causes, causation may be difficult to define, and causation-based ownership may overlap or be inconsistent with source-based ownership.

Suppose, for example, in response to an EPA initiative, that a refrigerator manufacturer designs and builds an energy-efficient refrigerator with performance that far exceeds that of other refrigerators on the market. An electric utility then offers rebates to customers if they purchase the energy-efficient refrigerator. Customers buy the refrigerator and accept the rebate. The customers purchase less electricity, and the electric utility generates less electricity from fossil fuels, thus reducing emissions. But who is "responsible" for the reduction, and on what grounds?

- The EPA (for sponsoring the initiative)?
- The refrigerator manufacturer (for building the refrigerator)?
- The refrigerator dealer (for choosing to buy and carry the efficient model in preference to some other model)?
- The electric utility (for offering the rebate)?
- The customer (for choosing to buy the refrigerator)?
- The customer (for purchasing less electricity)?
- The electric utility (for burning less fuel)?
- Some other electric utility (for burning less fuel, as a consequence of selling less electricity to the customer's utility)?

There is no perfect answer to this question. All the participants have some influence on the eventual outcome. Further, "responsibility" can have multiple meanings. Will a firm be made legally responsible for the emissions in some hypothesized future regulatory environment? Or, alternatively, who gets "recognition" for taking an action that reduces emissions?

In addition, different observers could choose a particular responsible party for different reasons, which means that they might agree on this example and disagree on some other example. Some might view the payment of the rebate as the "act" that makes the utility the "responsible" party. Others might view the utility as the responsible party because it was the utility whose emissions actually declined.

The guidelines, in accordance with legislative provisions and the objective of broad participation, do not assign the "right" to report emissions or reductions. Thus, in the Voluntary Reporting Program, all the participants in the hypothetical transaction described can justifiably report on their actions to reduce emissions, because ownership is not exclusive.

The Voluntary Reporting Program attempts to identify instances of multiple reporting and to clarify reporters' definitions of emissions. To clarify instances of multiple reporting, project-level reporters are asked whether other entities might be reporting on the same activity and, if so, who. Reporters are also asked about joint-venture partners (if any) for projects, which helps to identify a particular class of multiple reporting with precision.

In order to clarify the reporters' diverse definitions of "ownership" of emissions, the guidelines define (and the forms implement) the concept of "direct" and "indirect" emissions. "Direct" emissions are emissions from a source owned and controlled by the reporter. "Indirect" emissions are emissions that the reporter in some sense "caused" to occur, although the reporter did not own or control the facility producing the emission. The Voluntary Reporting Program requires reporters to specifically identify all reported emissions and reductions as either "direct" or "indirect." This distinction has proved useful in understanding reporters' definitions of "ownership."

In practice, with a few exceptions, reporters tended to have very straightforward and intuitive definitions of "their" emissions and "their" reductions; however, these straightforward and intuitive definitions were not always consistent across reporters. Nearly everyone tended to accept the notion that direct emissions and reductions belong to the owner of the source producing the emissions. Thus, if a reporter owns and operates a fossil fuel power plant, usually the reporter is viewed as being responsible for the emissions of the plant. In the case of a jointly owned plant, the reporting entity takes a prorated share of the "ownership" of the emissions.

In the case of sales of electricity, views were much more diverse. Electricity consumers, such as households and manufacturing firms, tended to view themselves as responsible for indirect emissions arising from their use of electricity. On the other hand, electric utilities also tended to view themselves as responsible for their customers' use of electricity.

Reporters accounted for wholesale electricity transactions in various ways:

- Distribution-only electric utilities tended to behave like end-use consumers and to view themselves as responsible for the electricity consumption of their customers and, hence, for the indirect emissions of their suppliers.
- Electric utilities that both bought and sold electricity had diverse views: some utilities assumed responsibility only for their direct emissions (i.e., sales to wholesale and retail customers) but took no responsibility for emissions associated with electricity purchases.
- Other utilities added direct emissions associated with their wholesale electricity purchases but did not deduct those associated with their wholesale electricity sales.
- Still others summed their wholesale purchases and sales of electricity to calculate "net" indirect emissions as an addition to direct emissions.

Each approach produces a different figure for the total emissions of the reporter, and there is no theoretical basis for defining one approach as "correct." Each approach has conceptual and practical merits and drawbacks, depending on the intended purpose of the calculation and the circumstances of the particular reporter.

In general, the treatment of wholesale power transactions is not always material to electric utility emissions estimates. In many cases, the volume of purchased power is small or stable over time. The importance of wholesale power transactions is likely to grow in the near future, however, if utility restructuring and changes in transmission access regulations greatly increase the amount of electric power traded among utilities in the United States. In the absence of a common definition of responsibility for wholesale transactions, it will be increasingly difficult to compare reports from different utilities without a careful study of the underlying assumptions.

Defining Reductions: The Nature of the Reference Case

The emphasis of the Voluntary Reporting Program is on reporting reductions in emissions; however, the development of the guidelines raised the question: reductions compared to what? The guidelines developed the notion that a "reduction" in emissions is defined by comparison with an alternative situation, called a "reference case." The guidelines defined two ways in which a reference case could be defined: "basic" and "modified."

A basic reference case is the most straightforward. A basic reference case is the reporter's level of emissions at some period in the recent past—for example, in the year 1990. This definition is closest to the definitions implicit in the Framework Convention and those used in the

Clean Air Act emissions trading scheme. If the reporter's emissions today are less than they were in 1990, then the size of the reporter's reduction is equal to the difference between current emissions and 1990 emissions.

Basic reference cases are most meaningful in the context of entity-wide emissions. When applied to specific projects, however, a basic reference case can often become ambiguous or meaningless. For example, suppose an electric utility offers a program to induce homebuilders to add more energy-efficient appliances to newly constructed houses. The new appliances will consume less energy in the future than some alternative device, but there are no baseline historic emissions. Any new project that is not an exact, one-for-one replacement for an old project faces a similar problem. It is useful to recall that one of the purposes of the Voluntary Reporting Program is to recognize and encourage actions that reduce greenhouse gas emissions, whether they are new or existing sources.

In the Voluntary Reporting Program, therefore, a second method of calculating reductions is provided: the "modified reference case." A modified reference case is, in effect, a hypothetical case. The notion is that a reporter's emissions would have been higher had certain actions not been taken. In the case of the electric utility above, the modified reference case would be the putative emissions of the new houses with the appliances that homebuilders would have chosen without the intervention of the electric utility, and the reduction would be the difference between emissions with the energy-efficient appliances and emissions with "typical" appliances.

Modified reference cases always have a degree of uncertainty about them, because it is never possible to be certain about what would have happened in the absence of a particular action. By providing modified reference cases, the guidelines permitted the reporting of an extensive range of important and interesting projects. In practice, most project reports used various forms of a modified reference case. About two-thirds of entity-wide reporters also used a modified reference case, indicating that while emissions increased, they did not increase as much as they would have increased in the absence of actions by the reporter.

Technical Reporting Issues

Reporting Fuel Cycle Effects

The authors of the Department of Energy's guidelines designed a program in which a broad range of emission reduction activities could be reported. They recognized, however, that projects might have significant consequences distant from the direct effects of the project itself. The particular issue that concerned the designers of the program was the measurement of fuel cycle effects. In many cases, fuel cycle effects are minor; however, in several relevant instances (e.g., electric cars and other alternative fuel vehicles) it is impossible to know whether or not a particular project actually reduces greenhouse gas emissions without estimating fuel cycle effects. The solution adopted by the guidelines was to create the concept of "primary" and "secondary" effects.

As an example, a reporter claims to have reduced emissions by replacing his gasoline-powered automobile with an electric automobile. The primary effect is the direct reduction in emissions from the reduction in burning gasoline. Most reporters would also consider the increased electricity consumption for the electric automobile to be a primary effect, but the emissions associated with the generation of that electricity would generally be considered as indirect emissions—a secondary effect. Other secondary effects might also be considered. For example, mining additional coal or producing additional natural gas to fuel electricity generation causes additional emissions of methane, whereas reducing gasoline consumption also reduces emissions from oil refining and methane emissions from crude oil and gasoline transportation and storage.

Primary and secondary effects are loosely related to direct and indirect emissions. Direct emission reductions are generally the primary effect. Indirect emission reductions may be a primary or a secondary effect, but the secondary effects almost always cause indirect emissions.

In practice, reporters almost universally ignored secondary effects (whether positive or negative) in their reporting. When queried about this point, reporters tended to argue that they had no basis for estimating secondary effects, which would require "certifying the accuracy" of an estimate of emissions from other industries remote in space and time from the reporter's knowledge and concern.

Mergers and Acquisitions

The definition of reference cases for measuring reductions presupposes that the definition of the entity itself remains stable over time. This is not always the case. Firms can merge, buy and sell assets, expand, shrink, or even go out of business altogether. In those instances, the basis for comparing past emissions with present emissions becomes more complex.

In general there are three approaches to an entity that is changing shape over time. One can either accept that a changing entity will produce changing emissions and report the results, or one can restate historical emissions "as if" the new entity had always existed. Finally, one can restate current emissions "as if" the older form of the entity existed today.

The CONSOL Coal Group chose the second approach in its report for data year 1995. CONSOL reported emissions estimates for 1990, 1994, and 1995 based on recorded measurements where possible and best estimates if measurements were unavailable. In 1993, CONSOL acquired Island Creek Coal Company, whose mines are located in a very gassy coal seam in Buchanan County, Virginia. Parallel to the financial accounting of mergers, acquisitions, and divestment guided by standard accounting practices, CONSOL has "restated" 1990 emissions to include emissions from the subsequently acquired Island Creek mines.

Each of the three approaches above will have its merits in particular situations. In many cases, however, the problem can best be addressed by proper accounting of changes in indirect emissions. For example, if a utility signs a power purchase agreement with an independent power producer (IPP), in principle it is outsourcing its power generation, and a reduction in direct emissions (from the utility's own capacity) is offset by an increase in indirect emissions (from the IPP).

Domestic and Foreign Actions

Reporters are permitted to file reports on actions both within the United States and abroad, but they are required to distinguish between domestic and foreign emissions and reductions and report them separately. The rationale for this distinction is that, on the one hand, the President's commitment under the Framework Convention is to reduce domestic emissions. Therefore, only domestic emissions "count" in achieving the President's commitment. On the other hand, it has long been an objective of U.S. climate change policy to promote "joint implementation," wherein one country participates in emission reduction projects in another country. Further, since greenhouse gas emissions have equal consequences no matter where the source of the emissions is located, foreign reductions are just as valuable as domestic reductions in ameliorating climate change. Therefore, both kinds of report are permitted, while the distinction between domestic and foreign reports is preserved. In practice, only a relatively small number of reports were received relating to projects or activities abroad, largely forestry projects.

Confidentiality

Section 1605(b)(3) requires the Energy Information Administration to offer protection from publication and Freedom of Information Act requests to reporters who are submitting trade secret and commercial or financial information. In practice, for most firms wishing to participate in a public, voluntary program, one of whose benefits is public recognition of their actions, confidentiality is unnecessary. Firms worried about proprietary data can refrain from reporting or design their reporting definitions to protect proprietary data. During the 1997 reporting cycle, none of the reporting entities requested confidentiality.

Emissions Trading

One of the most striking uses of a voluntary report occurred when Niagara Mohawk Power Corporation and the Arizona Public Service Company engineered the first-ever trade of carbon dioxide emission reductions. Arizona Public Service Company traded 20,000 sulfur dioxide allowances (obtained under the Clean Air Act Amendments) in exchange for rights to 2.27 million metric tons of carbon dioxide emission reductions achieved by Niagara Mohawk in the period 1991 through 1993. Niagara Mohawk donated the sulfur dioxide allowances to a nonprofit environmental organization, which subsequently retired the allowances, in effect reducing national sulfur dioxide emissions by 20,000 tons.

Both companies reported the transaction to the Voluntary Reporting Program: Nigara Mohawk incorporated the trade into its report, and Arizona Public Service indicated that it would use the tons acquired to reduce its 2000 emissins if necessary.

Data Validation and Accuracy

Section 1605(b) of the Energy Policy Act requires the Secretary of Energy to issue guidelines that "establish procedures for the accurate voluntary reporting of greenhouse gases." During the development of the Voluntary Reporting Program, there was considerable discussion of the related topics of "data validation" and "data accuracy." Some observers, who were concerned about the accuracy of emissions reporting, recommended "third-party validation," meaning, in essence, reviews or audits of reporting by disinterested third parties. The law also states: "Persons reporting under this subsection shall certify the accuracy of the information reported." That sentence has been interpreted to mean that it is the reporter who is responsible for the accuracy and correctness of the emissions and reductions claimed in the Voluntary Reporting Program.

The EIA devotes considerable effort to the review of incoming reports. Each report is assigned to an EIA reviewer, who reviews the reported information for internal consistency, accuracy of calculation, and comparability with other sources of information. The reviewer then prepares a list of issues for discussion with the reporter, who is asked about possible problem areas identified in the review. In many cases, reporters subsequently choose to revise their reports.

This work has given EIA useful insights into the potential and limitations of data validation and accuracy. Nothing in the review process has given credence to the idea that reporters have deliberately prepared and submitted inaccurate voluntary reports. Reporters have found the task of developing emissions and reductions estimates sufficiently daunting in itself. The notion of deliberately inaccurate reporting has tended to divert attention from the genuine problems faced by reporters in attempting to prepare accurate reports. Some of those problems included:

- Lack of generally accepted “accounting standards” for emissions. This left each reporter to make judgments about the limits of the reporting entity and the ownership of emissions. Most reports were clear about the judgments that had been made, but it still can be difficult to aggregate and compare reports.

- Imprecision in estimation methods. Emissions of greenhouse gases generally are estimated on the basis of operating data, particularly, consumption of fossil fuels. Estimates of direct emissions from the combustion of fossil fuels should be reasonably accurate; however, there are significant uncertainties inherent in the estimation of indirect emissions generally, as well as in the estimation of emissions (direct or indirect) of other gases (particularly, methane and nitrous oxide). Many reporters chose not to report indirect emissions or emissions of other gases because of those uncertainties.

- Limited expertise in emissions estimation. Organizations rarely collect information on greenhouse gas emissions, and they have no reason to develop corporate expertise in estimating emissions. Reporters must start from scratch in collecting underlying operating data and developing expertise in estimating emissions on the basis of operating data.

- Limited availability of data within the organization. A comprehensive emissions and reductions report might cover direct combustion of fossil fuels, electricity purchases, use of halogenated substances as refrigerants and solvents, consumption of transportation fuels (gasoline and diesel), and any process emissions peculiar to the reporter. Collecting such information within an organization can present significant challenges, particularly for manufacturing companies, where energy is a relatively small portion of total operating costs. Companies may not collect data on fuel, electricity, or refrigerant consumption at all, and many companies may record financial (but not quantitative) data in their accounting systems. Alternatively, the information may be collected only at the local (plant) level and never forwarded to corporate headquarters. In such cases, the person preparing the report must obtain information from a host of individual plant managers. Personnel in separately managed subsidiaries may be unable or unwilling to provide information. While current data may be available, historical data may be destroyed, archived, or otherwise practically unrecoverable.

These considerations have shaped the reports submitted to the Voluntary Reporting Program. Reporters have tended to calculate emissions where data are available, to make the calculations they can make, and to form reasonable judgments about what information they should meaningfully include.